Scenario ID	128
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Date	Wednesday, May 25, 2005
Goal	Injector Beam Maintenance
Level	High
Actors	Fermilab Beam Physicists Fermilab Operations Specialists LHC Operations Specialists
Trigger	A combination of factors has led to a situation where CERN feels it is appropriate for Fermilab to keep an eye on the maintenance of the LHC injector beam. These factors include: (1) The expert in this operation from CERN is visiting Fermilab for an extended period, (2) several Fermilab personnel, who are planning to move to CERN, need training and (3) a similar operation is contemplated for the ILC and ILC personnel from Japan are present at Fermilab.
Narrative	At 2107 GMT on a particular day when all three items of the Trigger are satisfied, an LHC Operations Specialist in the LHC Control Room (LHCCR) states that the beam from the injector to LHC is in need of maintenance. LHCCR confirms with a Fermilab Beam Physicist in the Fermilab Remote Operations Center (FROC) and a Fermilab Operations Specialist are available for this task, including visual (CCTV), telephone and LHC control system protocol verifications. LHCCR does the necessary operations to allow for regular beam in the injector, with the beam disposed into the main dump for the injector. FROC and LHCCR both confirm, from a CCTV camera trained on the dump, and from BPM readings, that the beam is safely going to the appropriate dump. LHCCR then grants permissions so that FROC can run the necessary application programs to do this measurement. This grant is set to expire at 0000 GMT. FROC personnel begin by checking the tunes. This is done through the application program that performs this operation. These tunes are manually verified through an oscilloscope, accessible through a secure HTML channel. However, it is determined that the vertical channel of the tune scope is disconnected. This is seen in three ways: (1) there is no coherent signal on this channel as seen on the scope, (2) changing the internal termination on the scope from 50 ohms to high impedance changes the character of the noise, implying that a cable, far from the scope, is open, (3) a CCTV camera on the detector in the tunnel shows that the cable is not on the connector squarely, at least that is what the camera seems to show. FROC request LHCCR for an access to reconnect this cable. FROC communicates this request through a Fermilab worker on shift, Jane Bush. Since the schedule is open, and since this cable is very close to a door, access is granted for 2315 GMT.

	FROC continues diagnosis by performing a chromaticity measurement. These measurements are completed at 2155 GMT. Their measurements reveal that the first sextupole circuit should be decreased by 3% and the second sextupole circuit should be increased by 5%. FROC informs LHCCR that this change should happen in two ways: Through an entry in the electronic log book (with a full explanation of the basis for requesting this change), and through a settings request protocol that transmits the requested new set points to the LHCCR. An automatic message is sent to the shift leader at the LHCCR indicating that the FROC has made an "important" entry in the log that needs to be read immediately, and the LHCCR shift leader also notices that a settings request has been issued. No action is taken at this time. At 2315 GMT, access into the LCH injector tunnel begins. Dr. Bush and Mr. Chirac, who is on shift in the LHCCR for CERN, enter the tunnel and reattach the cable at 2330 GMT. The tunnel is secure at 2340. Beam is reestablished to the dump at 2351. FROC requests an extension of 35 minutes for control of the injector tune up application program. This is granted—expiration is now 0035 GMT. FROC confirms that the vertical tune signal is valid, and thus the tunes are believable. The horizontal tune is within 0.001 of the previously-measured values at all energies in the ramp, but the vertical tune has changed by -0.01 at the beginning of flat top. The quadrupole circuit adjustment is calculated and, similar to above, a log book entry and a request through the settings request protocol is made at 0004. Appropriate experts are contacted at CERN to examine the FROC request for the tune and chromaticity changes. These changes are implemented by the LHCCR personnel at 0014. FROC and LHCCR simultaneously confirm the validity of the changes requested by the FROC. Then, FROC actively cancels their control over the LHC injector software 6 minutes early, at 0019 GMT. This action automatically sends a message to the LHCCR shift leader.
Exceptions	The LHC injector is needed for injecting into the LHC. Work is suspended until the injection cycle is complete.
Comments	No comments.